Heart and Heart-Lung Transplants

In the three decades since the performance of the first human heart transplant in December 1967, the procedure has changed from an experimental operation to an established treatment for advanced heart disease. Approximately 2,300 heart transplants are performed each year in the United States.

In 1981, combined heart and lung transplants began to be used to treat patients with conditions that severely damage both these organs. As of 1995, about 500 people in the United States and 2,000 worldwide have received heart-lung transplants.

There have been two main barriers to increasing the number of successful operations. In 1983, the first barrier to successful transplantations—rejection of the donor organ by the patient—was overcome. The drug cyclosporine was introduced to suppress rejection of a donor heart or heart-lung by the patient's body. Cyclosporine and other medications to control rejection have significantly improved the survival of transplant patients. About 80 percent of heart transplant patients survive 1 year or more. About 60 percent of heart-lung transplants live at least 1 year after surgery. Research is under way to develop even better ways to control transplant rejection and improve survival.

Organ availability is the second barrier to increasing the number of successful transplantations. Hospitals and organizations nationwide are trying to increase public awareness of this problem and improve organ distribution.

What happens during a heart or heart-lung transplant?

A transplant is the replacement of a patient's diseased heart or heart and lungs with a normal organ(s) from someone—called a donor—who has died. The donor's organ(s) is completely removed and quickly transplanted to the patient, who may be located across the country. Organs are cooled and kept in a special solution while being taken to the patient.

During the operation, the patient is placed on a heart-lung machine. This machine allows surgeons to bypass the blood flow to the heart and lungs. The machine pumps the blood throughout the rest of the body, removing carbon dioxide (a waste product) and replacing it with oxygen needed by body tissues. Doctors remove the patient's heart except for the back walls of the atria, the heart's upper chambers. The backs of the atria on the new heart are opened, and the heart is sewn into place. A similar process is followed in heart-lung transplants, except doctors remove the heart

and lungs as a unit from the donor; the new lungs are attached first, followed by the heart.

Surgeons then connect the blood vessels and allow blood to flow through the heart and lungs. As the heart warms up, it begins beating. Sometimes, surgeons must start the heart with an electrical shock. Surgeons check all the connected blood vessels and heart chambers for leaks before removing the patient from the heart-lung machine.

Patients are usually up and around a few days after surgery, and if there are no signs of the body immediately rejecting the organ(s), patients are allowed to go home within 2 weeks.

Why are transplants done?

A transplant is considered when the heart is failing and does not respond to all other therapies, but health is otherwise good. The leading reasons why people receive heart transplants are:

- **Cardiomyopathy—a weakening of the heart muscle.**
- **Severe coronary artery disease—in which the heart's blood vessels become blocked, and the heart muscle is damaged.**
- **Birth defects of the heart.**

Heart-lung transplants are performed on patients who will die from end-stage lung disease that also involves the heart. Alternative therapies for these patients have been tried or considered. Leading reasons people receive heart-lung transplants are:

- **Severe pulmonary hypertension—a large increase in blood pressure in the vessels of the lungs that limits blood flow and delivery of oxygen to the rest of the body.**
- **A birth defect of the heart that results in Eisenmenger's complex—another name for acquired pulmonary hypertension.**

Who can have a transplant?

Patients under age 60 are the most likely heart transplant candidates. Patients under age 45 are generally accepted for heart-lung transplants. In both cases, patients must be suffering from end-stage disease and be in good health otherwise. The doctor, patient, and family must address the following four basic questions to determine whether a transplant should be considered:

- **Have all other therapies been tried or excluded?**
- **Is the patient likely to die without the transplant?**
- **Is the person in generally good health other than the heart or heart and lung disease?**
- **Can the patient adhere to the lifestyle changes—including complex drug treatments and frequent examinations—required after a transplant?**

Patients who do not meet the above considerations or who have additional problems—other severe diseases, active infections, or severe obesity—are not good candidates for a transplant.

How are donors found?

Donors are individuals who are brain dead, meaning that the brain shows no signs of life while the person's body is being kept alive by a machine. Donors have often died as a result of an automobile accident, a stroke, a gunshot wound, suicide, or a severe head injury. Most hearts come from those who die before age 45. Donor organs are located through the United Network for Organ Sharing (UNOS).

Not enough organs are available for transplant. At any given time, almost 3,500 to 4,000 patients are waiting for a heart or heart-lung transplant. A patient may wait months for a transplant. More than 25 percent do not live long enough. Yet, only a fraction of those who could donate organs actually do.

Does a person lead a normal life after a transplant?

After a heart or heart-lung transplant, patients must take several medications. The most important are those to keep the body from rejecting the transplant. These medications, which must be taken for life, can cause significant side effects, including hypertension, fluid retention, tremors, excessive hair growth, and possible kidney damage. To combat these problems, additional drugs are often prescribed.

A transplanted heart functions differently from the old one. Because the nerves leading to the heart are cut during the operation,

the transplanted heart beats faster (about 100 to 110 beats per minute) than the normal heart (70 beats per minute). The new heart also responds more slowly to exercise and doesn't increase its rate as quickly as before.

A patient's prognosis depends on many factors, including age, general health, and response to the transplant. Recent figures show that 73 percent of heart transplant patients live at least 3 years after surgery. Nearly 85 percent of patients return to work or other activities they like. Many patients enjoy swimming, cycling, running, and other sports.

As noted, 60 percent of patients who receive combined heart-lung transplants survive at least 1 year. Fifty percent live at least 3 years.

What are the risks from transplants?

The most common causes of death following a transplant are infection or rejection of the heart. Patients on drugs to prevent transplant rejection are at risk for developing kidney damage, high blood pressure, osteoporosis (a severe thinning of the bones, which can cause fractures), and lymphoma (a type of cancer that affects cells of the immune system).

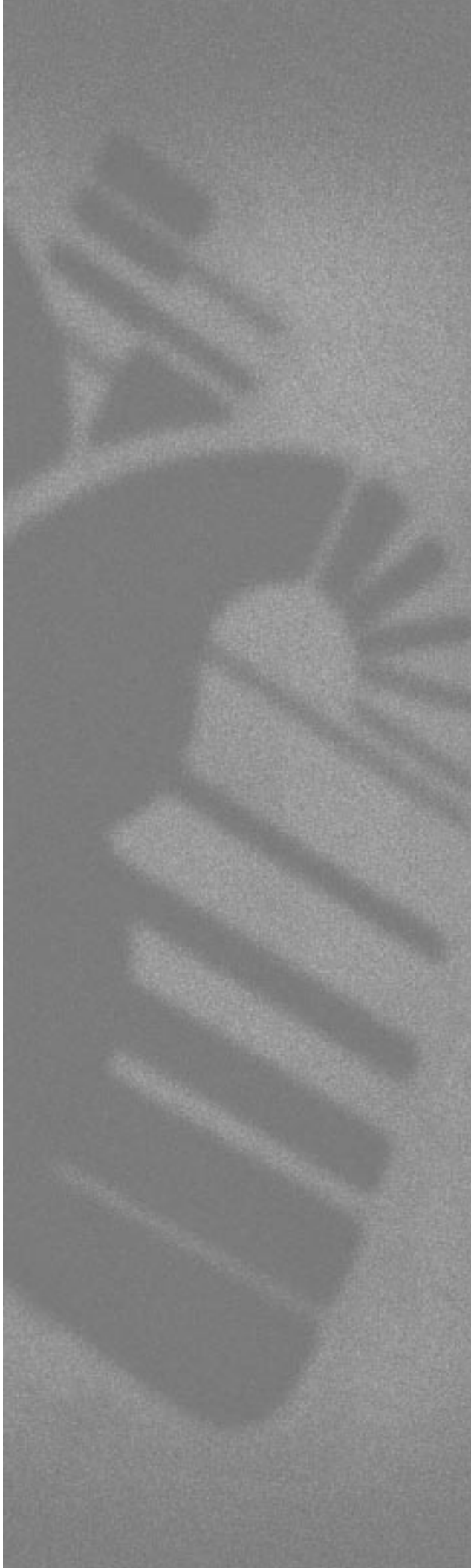
Coronary artery disease (atherosclerosis) is a problem that develops in almost half the patients who receive transplants. Normally, patients with this disease experience chest pain and/or other symptoms when their hearts are under stress. This is called angina and is an early warning sign of a blocked heart artery. However, transplant patients may have no early pain symptoms of a blockage building up because they have no sensations in their new hearts.

Thirty to fifty percent of patients who receive a heart-lung transplant develop bronchiolitis obliterans, in which there are obstructive changes in the airways of the lungs.

What does rejection mean?

The body's immune system protects the body from infection. Cells of the immune system move throughout the body, checking for anything that looks foreign or different from the body's own cells. Immune cells recognize the transplanted organ(s) as different from the rest of the body and attempt to destroy it—this is called rejection. If left alone, the immune system would damage the cells of a new heart and eventually destroy it. In a heart-lung transplant, immune cells may also destroy healthy lung tissue.

To prevent rejection, patients receive immunosuppressants, drugs that suppress the immune system so that the new organ(s) is not damaged. Because rejection can occur anytime after a transplant, immunosuppressive drugs are given to patients the day before their transplant and thereafter for the rest of their lives. To avoid complications, patients must strictly adhere to their drug regimen. The three main drugs now being used are cyclosporine, azathioprine, and prednisone.



Researchers are working on safer, more effective immunosuppressants for future testing. Some of the more promising drugs are FK-506 and mycophenolate mofetil.

Doctors must balance the dose of immunosuppressive drugs so that a patient's transplanted organ(s) is protected, but his or her immune system is not completely shut down. Without an active enough immune system, a patient can easily develop severe infections. For this reason, medications are also prescribed to fight any infections.

To carefully monitor transplant patients for signs of heart rejection, small pieces of the transplanted organ are removed for inspection under a microscope. Called a biopsy, this procedure involves advancing a thin tube called a catheter through a vein to the heart. At the end of the catheter is a bioptome, a tiny instrument used to snip off a piece of tissue. If the biopsy shows damaged cells, the dose and kind of immunosuppressive drug may be changed. Biopsies of the heart muscle are usually performed weekly for the first 3 to 6 weeks after surgery, then every 3 months for the first year, and then yearly thereafter.

How much do transplants cost?

According to the UNOS, the estimated first year charges for a heart transplant is $209,100, and annual followup charges are $15,000. In most cases these costs are paid by private insurance companies. More than 80 percent of commercial insurers and 97 percent of Blue Cross/Blue Shield plans offer coverage for heart transplants. Medicaid programs in 33 states and the District of Columbia also reimburse for transplants. Heart transplants are covered by Medicare for Medicare-eligible patients if the operation is performed at an approved center.

Approximately 70 percent of commercial insurance companies and 92 percent of Blue Cross/Blue Shield plans cover heart-lung transplants. Medicaid coverage for heart-lung transplants is available in 20 states. According to the UNOS, estimated first year charges for a heart-lung transplant is $246,000, and annual followup charges are $18,400.

What will transplants be like in 5 to 10 years?

Hospitals nationwide are trying to set up a better system for distributing organs to patients in need. Researchers are looking for easier methods to monitor rejection to replace the regular biopsies that are needed now. Work is progressing to make immunosuppressive drugs with fewer long-term side effects so that coronary artery disease development and lung destruction may be prevented.

WHERE CAN I GET MORE INFORMATION ON TRANSPLANTS?

Information is available 24 hours a day, 7 days a week from the UNOS at 1-800-24-DONOR. This hotline provides general information on transplants, current statistics, and listings of transplant centers. Internet address: http://www.ew3.att.NET/UNOS

Additional information is available from the Division of Transplantation, Health Resources and Services Administration, Room 7-29, 5600 Fishers Lane, Rockville, MD 20857. Telephone: 301-443-7577 Internet address: http://www.hrsa.DHHS.gov/bhrd/dot/dotmain.htm

FOR MORE INFORMATION ON HEART AND LUNG DISEASES, CONTACT:

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